

# **Human Biology**

Advanced Subsidiary GCE

Unit **F221**: Molecules, Blood and Gas Exchange

## **Mark Scheme for January 2011**

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Question		Expected Answer	Mark	Additional Guidance
1	(a)	<p><i>structure 1</i> beta / <math>\beta</math> , pleat / pleated sheet ;</p> <p><b>and</b> <i>structure 2</i> alpha / <math>\alpha</math> , helix ;</p>	1	<p>Both structures need to be named correctly for one mark. <b>DO NOT CREDIT</b> b for beta or a for alpha <b>For each structure, mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks</b></p>
	(b)	<p><u>hydrogen</u> (bond) ; <span style="float: right;"><b>1 max</b></span></p> <p>weak bond ; between , slightly negative and slightly positive / <math>\delta</math>-negative and <math>\delta</math>-positive , atoms / groups / charges ;</p> <p>oxygen has (slightly) negative charge ; hydrogen has (slightly) positive charge ; <span style="float: right;"><b>2 max</b></span></p>	3 max	<p>One mark for the name and max 2 for description.</p> <p><b>CREDIT</b> 'between carboxyl and amino groups' <b>CREDIT</b> presence of dipole <b>DO NOT CREDIT</b> 'between positive and negative'</p> <p><b>DO NOT CREDIT</b> reference to ions</p>
	(c)	<p><i>from flow diagram</i></p> <p><b>1</b> primary ; <b>2</b> quaternary ; <b>3</b> globular ; <b>4</b> haemoglobin / (named) enzyme / named globular protein ; <b>5</b> fibrin / named fibrous protein ;</p>	5	<p>e.g. thrombin / antibody e.g. keratin / collagen</p>

Question			Expected Answer	Mark	Additional Guidance
1	(d)	(i)	ribosome(s) / <u>rough</u> ER ;	1	Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks  CREDIT <u>R</u> ER
		(ii)	Golgi (body / apparatus / vesicle) ;	1	Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks
<b>Total</b>				<b>11</b>	

Question		Expected Answer	Mark	Additional Guidance																				
2	(a)	(named) ions ; urea ; hormones ;  amino acids ; glucose ; (named) blood gases ;	2 max	<b>Mark the first TWO answers only.</b>  <b>IGNORE</b> vitamins / minerals / plasma proteins / antibodies / clotting factors  <b>CREDIT</b> electrolytes  <b>CREDIT</b> named hormone if correct e.g. insulin <b>DO NOT CREDIT</b> steroid hormones e.g. oestrogen																				
	(b) (i)	lymph / lymphatic (vessel / capillary) ;	1	<b>Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks</b>  <b>DO NOT CREDIT</b> 'lymph node' or 'lymph gland'																				
	(ii)	<table border="1"> <thead> <tr> <th>component</th> <th>blood plasma</th> <th>tissue fluid</th> <th></th> </tr> </thead> <tbody> <tr> <td>erythrocytes</td> <td>✓</td> <td>✗</td> <td>;</td> </tr> <tr> <td>sodium ions</td> <td>✓</td> <td>✓</td> <td>;</td> </tr> <tr> <td>fibrinogen</td> <td>✓</td> <td>✗</td> <td>;</td> </tr> <tr> <td>glucose</td> <td>✓</td> <td>✓</td> <td>;</td> </tr> </tbody> </table>	component	blood plasma	tissue fluid		erythrocytes	✓	✗	;	sodium ions	✓	✓	;	fibrinogen	✓	✗	;	glucose	✓	✓	;	4	<b>One mark for each correct row.</b> <b>DO NOT CREDIT</b> hybrid ticks  Both ticks <u>and</u> crosses must be used. Do not interpret blank spaces for crosses.
component	blood plasma	tissue fluid																						
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glucose	✓	✓	;																					
	(c) (i)	(named) cells are removed / centrifugation / use a centrifuge / described ;	1	<b>IGNORE</b> removal of calcium ions <b>ALLOW</b> e.g. 'spin in machine' for described																				
	(ii)	no / less, fibrinogen / clotting factors (in serum) ;	1	<b>CREDIT</b> clotting factors / fibrinogen, present in (stored) plasma																				
<b>Total</b>			<b>9</b>																					

Question			Expected Answer	Mark	Additional Guidance
3	(a)	(i)	A ;	1	<p>Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p><b>ALLOW</b> phospholipid bilayer</p>
		(ii)	C ;	1	<p>Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p><b>ALLOW</b> intrinsic or channel protein</p>
	(b)		insoluble in (phospho)lipids ; large ; polar / hydrophilic / not hydrophobic ;	2 max	<b>IGNORE</b> reference to glucose being soluble in water
	(c)	(i)	<p>1 <i>idea that</i> lipoprotein / (large) molecules / cells / bacteria, move towards membrane ;</p> <p>2 membrane invaginates / AW ;</p> <p>3 engulfed ;</p> <p>4 vesicle forms (around, molecules / cells / bacteria) ;</p> <p>5 (vesicle) nipped off from membrane / AW, and enters cell ;</p> <p>6 AVP ;</p>	4 max	<p><b>ACCEPT</b> marks from fully labelled or annotated diagrams</p> <p><b>CREDIT</b> 'substances close to or in contact with membrane'</p> <p>e.g. engulfing triggered when bacteria bind to membrane reference to phagocytosis receptor-mediated process requires ATP</p>

Question			Expected Answer	Mark	Additional Guidance
3	(c)	(ii)	<i>idea that</i> membrane , structure / function, disrupted ;  AVP ;	1 max	<b>DO NOT CREDIT</b> 'cell bursting' or reference to rigidity <b>CREDIT</b> change in stability or change in fluidity of cell membrane  e.g. raised blood LDL levels atherosclerosis steroid hormones not synthesised
<b>Total</b>				<b>9</b>	

Question		Expected Answer	Mark	Additional Guidance
4	(a)	<p>1 by , lipase / <b>enzyme(s)</b> ;</p> <p>2 <b>hydrolysis</b> / described ;</p> <p>3 breaks <b>ester</b> bonds ;</p> <p>4 between / producing , fatty acids <u>and</u> <b>glycerol</b> ;</p>	3 max	
		QWC ;	1	<p><b>Two</b> of the following terms, used in the appropriate context with correct spelling:  <b>enzyme ester glycerol hydrolysis</b></p>
	(b)	<p>constituent of , phospholipids / cell membranes ;  respiratory substrate / energy source ;</p> <p>AVP ;</p>	2 max	<p><b>Mark the first TWO answers only.</b></p> <p><b>IGNORE</b> energy store, insulation, storage of fat-soluble vitamins, protection of organs, <u>fast</u> energy source</p> <p><b>DO NOT CREDIT</b> reference to energy being created or produced or made</p> <p>e.g. steroid synthesis  maintaining healthy cholesterol levels</p>
	(c) (i)	<p><i>saturated fatty acids</i>  do not contain , double bonds between <u>carbon</u> atoms ;  do not have change in bond angle  in the hydrocarbon tail / AW ;  have <u>higher</u> (relative) proportion of hydrogen / AW ;</p>	2 max	<p><b>CREDIT</b> suitable ora for unsaturated fatty acids  <b>IGNORE</b> reference to properties of saturated fats  e.g. solid at room temperature</p> <p><b>CREDIT</b> do not have C=C bonds</p>
	(ii)	<p><i>polyunsaturated fatty acids</i>  have , more than one / many ,  double <u>carbon</u> bond (in hydrocarbon tail) ;</p>	1	<p><b>CREDIT</b> have more than one or many C=C bonds</p>
<b>Total</b>			<b>9</b>	

Question		Expected Answer		Mark	Additional Guidance
5	(a)	1	patient , standing (up straight) / not slouching ;	3 max	<p><b>DO NOT CREDIT</b> deep breath unqualified.  <b>CREDIT</b> deep breath <u>in</u></p> <p><b>CREDIT</b> ‘breathe out as hard as you can for as long as you can’</p>
		2	zero the meter / make sure that the indicator is at bottom (of the scale) ;		
		3	deep inhalation (to fill lungs with air) / AW ;		
		4	ensure lips form seal around mouthpiece / AW ;		
		5	exhale , forcibly / AW , in one continuous breath ;		
	(b) (i)	D1	<i>description</i> (with increasing age) PEFR increases <u>and</u> then decreases ;	4 max	<p><b>Max 3 for reasons</b></p> <p><b>CREDIT</b> peak flow values <u>with units</u> (or calculated difference e.g. subtraction or multiplication) for 2 stated ages</p> <p><b>CREDIT</b> lung capacity decreases after 35 years  <b>IGNORE</b> reference to surfactant  <b>ALLOW</b> intercostal muscles or diaphragm weakens with age  e.g. have been smoking longer</p>
		D2	PEFR peaks at 35 ( $\pm 1$ ) years ;		
		D3	comparative figures ;		
		R1	<i>reasons</i> chest size increasing from 20 to 35 years ;		
		R2	increasing lung capacity to 35 years ;		
		R3	<i>idea that</i> ageing affects lung tissue ;		
		R4	more exposure to pollution (affecting lungs) ; <b>3 max</b>		
	(ii)		10 ; ;	2	<p>If answer is incorrect or not given to a whole number or incorrectly rounded, then allow <b>one mark</b> for</p> $50 \div 500$ <p><b>or</b></p> $(500 - 450) \div 500$

Question			Expected Answer		Mark	Additional Guidance
5	(c)	(i)	<p>(named) respiratory diseases ;  obstruction of airways / choking / suffocation ;  cardiac arrest / heart attack / myocardial infarction ;  AVP ; ;</p>		2 max	<p><b>Mark the first TWO answers only.</b>  <b>IGNORE</b> asthma as given in stem of the question</p> <p>e.g. bronchitis, COPD, emphysema or pneumonia</p> <p>e.g. electrocution  traumatic brain injury  anaesthesia  anaphylactic or electric shock (not shock alone)  poisoning  drug overdose  (near) drowning</p>
		(ii)	<p><b>1</b> tilt head back (to open airway) ;  <b>2</b> check airway for obstructions ;  <b>3</b> pinch nose and seal mouth ;  <b>4</b> give two (rescue) breaths ;  <b>5</b> look to see if chest is rising ;  <b>6</b> repeat (if necessary) / AW ;  <b>7</b> <i>idea of oxygen being delivered to the patient ;</i></p>	3 max		<p><b>IGNORE</b> ref to procedure used for children</p> <p>e.g. one breath every five seconds</p>
<b>Total</b>					<b>14</b>	

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(i)	closed (circulation) ;	1	Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(ii)	materials / named example , flow in one direction ;	1	IGNORE ref to speed
	(b)	(i)	<p>1 smooth muscle contracts <u>and</u> relaxes ;</p> <p>2 <i>idea that</i> it controls , size / <b>diameter</b>, of lumen ;</p> <p>3 <b>elastic</b> tissue stretches <u>and</u> recoils ;</p> <p>4 allows artery (wall) to stretch , when ventricles contract / during (ventricular) <b>systole</b> ;</p> <p>5 and recoil , when ventricles relax / during (ventricular) <b>diastole</b> ;</p> <p>6 maintains blood at high pressure ;</p>	3 max	<p><b>DO NOT CREDIT</b> contraction in context of pumping</p> <p><b>IGNORE</b> vasoconstriction / vasodilation</p> <p><b>DO NOT CREDIT</b> elastic tissue expands or contracts</p> <p><b>ALLOW</b> expand in place of stretch when referring to artery (wall)</p>
			<b>QWC</b> ;	1	<p><b>Two</b> of the following terms, used in the appropriate context with correct spelling:</p> <p><b>smooth muscle</b>      <b>contract(s)</b></p> <p><b>diameter</b>              <b>elastic</b></p> <p><b>recoil</b>                  <b>systole</b></p> <p><b>diastole</b></p>
		(ii)	<p><i>in veins</i></p> <p>same volume of blood passing through ;</p> <p>(diameter of) lumen is large ;</p> <p>(so) blood at low pressure ;</p> <p>(so) blood flows slowly ;</p>	2 max	<b>CREDIT</b> suitable ora statements for arteries
<b>Total</b>				<b>8</b>	

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